



# Participatory arts and affective engagement with climate change: The missing link in achieving climate compatible behaviour change?

Miriam Burke<sup>a</sup>, David Ockwell<sup>b,\*</sup>, Lorraine Whitmarsh<sup>c</sup>

<sup>a</sup> Dept of Geography, Royal Holloway, University of London, Egham, Surrey, UK

<sup>b</sup> Department of Geography, School of Global Studies, University of Sussex, Brighton, UK

<sup>c</sup> School of Psychology, University of Cardiff, Cardiff, Wales, UK



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## ABSTRACT

Despite a growing number of arts based climate change interventions and the importance emphasised in the social psychology literature of achieving affective (emotional) engagement with climate change before climate compatible behaviour change is likely, to date there has been no systematic application of interpretive social science techniques to understand the ways in which these arts based interventions do or do not achieve affective public engagement with climate change and hence might hold the key to unlocking broader climate compatible behaviour change. This article makes two key contributions. First, it analyses the literature across social psychology and participatory arts to demonstrate why participatory, climate change based arts interventions could hold the key to more effective approaches to engaging multiple publics in climate compatible behaviour change. Second, using a small sample of participants in an arts based climate change intervention in the Inner Hebrides, Scotland, it demonstrates the potential value of combining social science techniques (in this case Q Methodology) with participatory arts interventions to better understand and learn from the ways in which climate based arts interventions achieve affective public engagement with climate change. This raises the potential for a significant new research and policy agenda looking forward.

## 1. Introduction

Individual behaviour change forms a core part of global responses to climate change mitigation and adaptation. A body of scholarship has emerged from the social sciences which seeks to understand how climate compatible behavioural change might be deliberately encouraged through different communication approaches. To date, however, the role of the arts in this area remains under researched, despite high profile calls for more attention to their potentially critical role in understanding and responding to climate change (e.g. Hulme, 2011) and a large emerging body of work in the arts and humanities that explicitly engages with climate change. What is missing is the use of social science techniques to understand the nature and extent of any influence of arts based climate change initiatives upon people's engagement with climate change (a necessary step if climate communication efforts are to effectively utilise arts based approaches as part of broader efforts to engage the public with climate change). This paper represents a first step towards addressing this gap.

Insights from social psychology based research on climate communication emphasise that behaviour change will not occur without both

cognitive engagement (people need to understand the issue) and affective (or emotional) engagement (people need to care about the issue) (Lorenzoni et al., 2007); and that, in fact, the latter is likely to be more influential than the former in shaping perceptions and motivating action (Loewenstein et al., 2001; O'Neill et al., 2013; Pallett and Chilvers, 2013). Yet, to date, most policy efforts around climate communication have focussed on achieving cognitive engagement (i.e. informing about causes, impacts or solutions), often focussing on rational arguments, such as financial benefits of energy saving (Whitmarsh et al., 2011b). In the UK, for example, despite government spending on information campaigns, low-carbon behaviour change remains limited, with most people seeing climate change as something that will not affect them personally in their lifetime (Leiserowitz, 2006) despite high levels of public awareness of the issue of climate change. It has been hypothesised that a key reason for the failure of these behaviour change campaigns is their neglect of affective (emotional) engagement, contributing to the oft cited "attitude-behaviour" gap (Hulme, 2011; Ockwell et al., 2009). It is argued that some of the obstacles to personal engagement with climate change are in part due to the fact that the very idea of 'climate' is a statistical phenomenon; measured on timescales

\* Corresponding author.

E-mail addresses: [Miriam.Burke.2013@live.rhul.ac.uk](mailto:Miriam.Burke.2013@live.rhul.ac.uk) (M. Burke), [d.ockwell@sussex.ac.uk](mailto:d.ockwell@sussex.ac.uk) (D. Ockwell), [WhitmarshLE@cardiff.ac.uk](mailto:WhitmarshLE@cardiff.ac.uk) (L. Whitmarsh).

frequently longer than human lives (e.g. Hulme, 2009). This type of abstract information relies on analytical processing of second hand information, rather than emotional understandings based on lived experience (Epstein, 1994; Weber, 2006). This, in turn, creates a perception that climate change affects temporally and geographically distant people, and is therefore perceived as irrelevant to people's day-to-day lives (Hulme, 2009).

This paper focuses on an area that holds significant promise (across multiple cultural contexts) for addressing this “affective gap” in existing public engagement efforts – namely the use of participatory arts-based interventions, as opposed to reliance on supposedly “objective” communication of scientific facts. As Hulme (2011) asserts, the arts have a key role to play in societal efforts to respond to climate change through shedding ‘... new light on the multiple meanings of climate change, and [creating] new entry points for policy innovation’ (Hulme, 2011: 178). It is possible to come away feeling emotionally affected by a scientific talk (particularly if you are a scientist). It is more likely, though, that one would walk away from a film, a play or an art exhibition having experienced some sense of emotional effect (Capstick et al., 2015; Lorenzoni and Whitmarsh, 2014; Weber, 2016). After all, it is the remit of the arts to explore issues of social relevance in ways that effect emotional responses; to provide new media through which preconceived ideas are exposed and challenged; and to tell stories in ways that both express and play a part in the ways humans construct and experience their life-world(s).

It is not surprising, then, that there are many artworks and art projects which have engaged directly with the idea of climate change; for example the work of *Cape Farewell*, *Tipping Point*, the *Artists and Climate Change* web site and the *Imagine 2020 Art and Climate Change* network. What is surprising is the gap in the literature relating to any attempts to utilise social science techniques in order to understand to what extent, and how affective or behavioural engagement results from such arts based interventions. Social scientists have engaged with visual and film based representations of climate change (see for example Leiserowitz, 2006; Lowe et al., 2006; O'Neill and Nicholson-Cole, 2009; O'Neill and Smith, 2014; Sheppard, 2005). These studies have highlighted the work that images do, both at the point of production and the point of consumption (O'Neill and Smith, 2014), and the powerful effect imagery can have on the emotions (Leiserowitz, 2006; Nicholson-Cole, 2005; Sheppard, 2012). But these have predominantly focussed on media disseminated imagery. Little social science research has been done to understand the impacts of either art production or art consumption on audience engagement with climate change.

In recent years, there has been an upsurge in humanities based approaches engaging with artworks and creative practice more broadly. These studies can take the form of a geographical critique of the artist and artistic technique (Engelmann, 2015; Foster and Lorimer, 2007; Hawkins, 2010; Jellis, 2015; Yusoff, 2007); or an exploration of image making and creative methods as geographical practice (Bryan, 2011; Hawkins et al., 2015a,b; Howell, 2011; Tolia - Kelly, 2008). Williams (2016) stresses the importance of engaging with ideas of materiality and agency in the creative process; and many other studies coming from the field of geohumanities and posthumanities have followed this route as a way to engage with more than human social worlds, in particular, to think through ideas raised by the idea of the anthropocene (Dixon et al., 2012; Hawkins et al., 2015a,b; Hawkins and Straughan, 2014; Ingram, 2013).

Today, there is a rich body of geographical literature engaging specifically with climate change and environmental concerns through art, literature, performance and creative practices (Bottoms, 2012; Cant and Morris, 2006; Daniels and Endfield, 2009; Endfield and Morris, 2012; Miles, 2010; Trexler and Johns-Putra, 2011; Yusoff, 2010; Yusoff and Gabrys, 2011); including an excellent study into the more than human social worlds of the Bird Yarns birds, the empirical focus of this paper, by Hawkins et al., 2015a,b. While there are many humanities based studies of artworks, and in particular climate change artworks,

however, these have predominantly engaged with the artworks and participants themselves (including material and nonhuman participants), rather than the audience. Therefore, there is a need for an understanding of how these artworks are interpreted and evaluated by a lay audience from a social science perspective. A social science based research focus on climate change art addresses a fundamental concern within contemporary social science with the role of lay knowledges in science, technology and public policy (e.g. Fischer, 2000; Jasanoff, 2004; Wynne, 1996).

Bird Yarns, the climate change focussed artistic intervention that forms the empirical focus of this paper, was a community knitting project, run by artist Deirdre Nelson and supported and funded by Cape Farewell on the Isle of Mull in summer 2012. As well as the audience who came to see the artwork, there was a group of local people who contributed to the physical making of the artwork by knitting arctic terns in a weekly knitting group (as well as an international online group who also knitted birds, but for the purposes of this study, we focus on the local knitting group). From a climate change perspective, this type of community based artwork, one that is produced and consumed by local people within a specific location, is worth investigating because it can offer key insights into non-“climate expert” disseminated visualisations of climate change (unlike media campaigns, which tend to be scientist or expert led, and often tied to a specific agenda). Therefore, in a project like this one, it is the lay understandings of climate and climate change which are brought to the fore, responding to calls for a more nuanced approach to creative and lay representations of, and engagement with, climate change (Brace and Geoghegan, 2010; Ereaud and Segnit, 2006a; Whitmarsh et al., 2011b). Creative engagements with local environments, and the ways in which they are changing, are of relevance in terms of indigenous knowledges as well as developing country contexts, where scholars from different disciplines are developing arts-based interventions with communities to explore local construction of climate and change in their own lived worlds. This also links to emerging work on the role of museum exhibits (Rees, 2017).

The emotional effects of artworks on audiences are likely to be complex, long-term, yet nonlinear and difficult to attribute to a particular moment, making studying them from a social science perspective somewhat tricky. However, there are specific, immediate questions arising from these forms of climate change engagement that social science techniques applied to artworks are able to elucidate. There is a significant gap in the climate change literature around the impact of art practices on the wider audience who come to see and interact with them, and this raises important questions. Do arts-based interventions around climate change offer a way of achieving affective engagement with climate change (increasing the chances of subsequent behavioural changes)? Are they a means through which a more locally situated space for understanding, expressing and engaging with climate change is created, and if so is this significant in their impacts on people's levels of engagement with climate change (specifically; cognitive, affective or behavioural effects)? Do they overcome some of the stubborn barriers to encouraging climate compatible behavioural change that existing social science research on climate change communication has highlighted, such as the role of prior attitudes in mediating how people process new information (Corner et al., 2012)? All these are questions that could be answered were social science based techniques to be employed alongside arts-based engagements with climate change. And all are questions whose answers will shed new light on the nature of interventions (whether through policy interventions or grassroots initiatives) that are most likely to provide the basis through which locally meaningful public engagement with climate change can be facilitated.

In the face of the above gaps and the potential significance of scholarship that integrates social science techniques with arts-based interventions, this paper seeks to contribute in three key ways. First, it interrogates a range of existing literatures to highlight a number of key insights of relevance to future research that might seek to utilise social

science techniques to explore the impacts of participatory art based engagements with climate change on both producers and consumers of such art. This represents a first start at situating participatory art (including the findings of the current study) within the context of existing scholarship on climate change communication, including attending to the role of prior attitudes in mediating new information, the efficacy of positive imagery and issues around trusted sources of climate change information. Second, it presents the findings of a case study that is the first example we are aware of where social science based techniques have been employed to explore the impacts on producers and consumers of a climate change inspired local participatory arts intervention (the “Bird Yarns” intervention described above). Thirdly, it extends its analysis to engage explicitly with the under-researched issue of the role of place attachment and local, situated knowledge in mediating the influence of climate change communication. The case study presented in the paper is based on an in-depth engagement (via surveys, interviews and a Q Study – see below) with a small sample of fifteen people, who came to see the art work (the use of Q Methodology being of particular utility here due to its ability to generate statistically significant results from small participant numbers). In light of the small sample size it is certainly *not* the intention of the paper that the findings be interpreted as anything alluding to universal truths or sufficient to support, in and of themselves, any blanket policy prescriptions for future climate communication efforts. Rather, the intention is to use this study as an initial entry point for future research efforts that combine social science techniques with arts and humanities based work on climate change; an entry point that aims to both highlight the potential value of such an interdisciplinary marriage at the same time as indicating a number of insights that contribute towards articulating a new agenda for future research, policy and practice.

The paper begins by reviewing some of the key conceptual insights from the climate communication literature against which this and other studies might situate their analysis. It then goes on to describe the methodology employed and its results. The paper concludes by reflecting on these findings and their significance for conceptual and empirical work in this emerging field and for policy and practice.

## 2. Insights from research on climate change communication

### 2.1. Images and emotional engagement with climate change

Psychological models of risk perception suggest that two parallel and interacting modes of information processing influence awareness – there is an analytic, rational and cognitive system and an emotionally driven, experiential system (Epstein, 1994:704). The emotional system is powerful, fast and visceral and evolved to keep us from harm, long before the evolution of abstract thought. An abstract concept such as climate change is dependent on rational understandings of statistical risk provided by experts; hence, many argue that the visceral and emotional reactions which are predominantly based on personal experience do not occur – climate change is too slow, long or distant to register on this level (Leiserowitz, 2006; Weber, 2006). Yet these emotional reactions are essential to the decision-making process, and the stronger the emotion the more powerful its influence (Bechara and Damasio, 2005; Damasio, 1994). Furthermore, affective reactions to risk have primacy in decision-making (the so-called ‘risk-as-feelings hypothesis’), such that where cognitive and affective assessments of risk diverge, it is affective assessments which tend to drive behaviour (Loewenstein et al., 2001). An emotional investment appears to be very important in shaping values, attitudes and beliefs about the natural world and the stronger a person’s emotional reaction the more likely they are to engage in pro-environmental behaviour (Chawla, 1998,1999; Kollmuss and Agyeman, 2002).

Building on this knowledge, research has investigated ways of engaging people with climate change on this emotional and visceral level through the use of imagery, which is processed in a different manner to

statistics and language (Nicholson-Cole, 2005; O’Neill and Smith, 2014; Sheppard, 2005). Studies have looked at the use of images in the media – newspapers, television and film (Leiserowitz, 2006; O’Neill and Nicholson-Cole, 2009), as well as how images have been used by campaign groups such as NGOs and charities (Doyle, 2007), advertising and media, and science (for a recent review see O’Neill and Smith, 2014).

It is generally agreed that applying visual imagery to the communication of climate change is a powerful tool for emotional engagement, yet authors warn that negative emotions – such as provoked by apocalyptic visions of the future – can be detrimental to the decision-making process and result in denial, distancing, apathy and resignation (Bechara and Damasio, 2005; Kollmuss and Agyeman, 2002; Moser, 2007; O’Neill and Nicholson-Cole, 2009). The majority of the imagery studied in these papers has been mostly large-scale campaigns aimed at a broad audience – and from the point of view of governments, scientists or campaign groups. Often the imagery used is clichéd with many of the visual icons of climate change becoming tired and no longer of interest to many people, e.g. Yusoff (2010) and O’Neill and Nicholson-Cole (2009) highlight the image of a polar bear floating on an ever shrinking platform of ice.

In light of this, some scholars have argued that original artworks can offer exciting opportunities for engagement by bringing novel representations, which can sidestep these over-worked images (see Miles, 2010; O’Neill and Smith, 2014; Whitmarsh, 2011; Yusoff and Gabrys, 2011). However, O’Neill and Smith, 2014: 82) suggest that ‘... many [artistic] visualisations verge on the incredible, and may act to distance people from engaging with climate change’ (citing Miles, 2010). This steers our attention towards the potential relevance, emphasised in the introduction above, of participatory art, produced and consumed by local people within the specific locales wherein they make sense of the issue of climate change.

### 2.2. Trust in information sources, place attachment and situated knowledge

The perceived reliability of a source of information plays a major part in the way that information is received by individuals and the likelihood of it being accepted (Comer et al., 2012); with information far more likely to be accepted if it is from a source that an individual trusts, be that a television personality, a respected member of the community or a friend or relative (Moser and Dilling, 2011; Petty and Cacioppo, 1986). For example, it has been argued that a mistrust of governments amongst the wider populace has been a contributing factor in the failure of national behaviour change campaigns such as ‘Act on CO<sub>2</sub>’ (Ockwell et al., 2009). Aside from low confidence in governments, there is added mistrust engendered by the media – with its propensity to show two sides of an argument, which in turn lowers public trust in the scientific findings of climate change as ‘uncertainty’ in science is often viewed as something negative (Shome and Marx, 2009); with the media and non-scientists tending to infer that scientists do not know anything about a topic, just because they do not know everything (Pollack, 2005). This has led to much uncertainty about the reality and severity of climate change amongst the UK public (Poortinga et al., 2011).

In the developed world, most studies have focussed on the dissemination of climate information through the media and other mass communication channels. However, this is only part of the picture. People are exposed to information and opinion about climate change from many other channels, including local organisations, community events and peers. This localised spread of climate information is more widely studied in the development studies literature, with a practical focus on credible sources of climate information and seasonal forecasts for farmers in developing countries. This literature suggests that building long-term relationships of trust through individuals and organisations is crucial if local people are to act on the information they receive (e.g. Tall, 2010).

This localised approach to issues around trust and sources of information has been less well researched in developed countries. As emphasised in the introduction above, however, and reflecting broader contemporary concerns in the social sciences around the role of expert and lay knowledges, critics have begun to emphasise a need for a more nuanced understanding of climate change – an understanding that ventures into the realm of bottom-up, non-expert perceptions that locate climate change within people's everyday lived experience (Brace and Geoghegan, 2010; Nerlich et al., 2010; Ungar, 2007; Whitmarsh et al., 2011a). Ereaut and Segnit (2006b), for example, suggest that there are valuable lessons to be learnt from locally organised initiatives that use languages of popular culture, rather than the discourses of politics and the public sector. This view advocates that climate change become common parlance with a move away from unidirectional communication campaigns towards informal conversations, dialogue and reflexive engagement; where the issue can take on a life of its own (c.f. Butler et al., 2011; Moser, 2007; Ungar, 2007). This type of approach would enable researchers to explore how people do locate climate change within their everyday lived experience, rather than focussing on the barriers to engagement (c.f. Shove, 2010) – and open the debate to means by which people feel empowered and engaged with the issue, leading to more avenues through which to discuss climate (see for example Ellis et al., 2007). The kinds of creative projects epitomised by participatory arts initiatives, which actively involve their audience and encourage conversation and debate, provide clear examples of this type of peer-to-peer, non-expert led communication – especially in cases where the artist is themselves a non-scientist. This has wider implications in terms of more democratically legitimate knowledge production and decision-making in the face of scientific uncertainty (Fischer, 2000; Jasanoff, 2004; see Leach et al., 2010 for an overview of Q; Ockwell, 2008; e.g. Pielke, 2005; Stirling, 2008; Wynne, 1996).

It is, therefore, through these two lenses of trust and situated knowledge that we engage with ideas around place attachment in this paper. We are aware, however, that there are other literatures (e.g. environmental psychology literature focusing on individuals' links to a geographical location, related to individuals' characteristics, experiences and situational context (Manzo and Devine-Wright, 2013)) which we do not explore in this paper and which might provide additional, useful avenues through which to explore issues around place attachment in future research.

### 2.3. Prior values and attitudes and biased assimilation

Situated, participatory knowledge production also addresses the heterogeneity of public perceptions of and responses to climate change. Responses range from denial to apathy to deep concern (Whitmarsh, 2011) due to the idiosyncratic nature of risk perception. A key determinant of this heterogeneity is individuals' prior values which mediate how they process, and whether they accept or reject, new information. Evidence that conflicts with an individual's prior beliefs is far more likely to be rejected than evidence which affirms or agrees with them, a process known as biased assimilation (see Corner et al., 2012; Maio and Haddock, 2010). In the context of climate change, pre-existing environmental (and political) values have been found to be key determinants of information acceptance or scepticism, more so than demographic or knowledge factors; and they also tend to remain relatively stable over time (Corner et al., 2012; Whitmarsh, 2011; Whitmarsh and O'Neill, 2010). The stronger a person's attitude towards the environment, the more strongly they are likely to either accept or reject information which agrees or disagrees with their own pre-existing values. People with less entrenched prior attitudes are more likely to deliberate over and openly consider new information, and to exhibit attitude change as a result of it (Maio et al., 1996). Biased assimilation may thus pose a challenge for those wanting to foster broader public engagement with climate change.

## 3. Methodology

### 3.1. Research questions and case study

In order to explore the above issues in relation to participatory arts, this paper focuses on a case study of a localised, bottom-up climate change art initiative (c.f. Brace and Geoghegan, 2010; Ereaut and Segnit, 2006a; Nerlich et al., 2010; Ungar, 2007). Building on the conceptual insights from the climate communication literature outlined above, the case study was interrogated via the following three research questions:

- 1 To what extent and in what ways do participatory arts-based initiatives influence affective engagement with climate change?
- 2 In what ways, if at all, are issues of trust and place attachment addressed?
- 3 Do prior values and attitudes influence the ways in which people engage with climate change art?

The case study was chosen with specific guidelines in mind: it should not be a representation of a possible future impact which – as highlighted in the literature could distance viewers – but an illustration of an effect of climate change that is locally specific and proximal; as if made visible through the imaginative production of the artist and local collaborators. This was to ensure that the case avoided the pitfalls of the use of future impacts and apocalyptic scenarios, which can lead to distancing, apathy and denial.

The selected case study was a community participatory knitting project by Deirdre Nelson called *Bird Yarns*, commissioned by Cape Farewell as part of their 4 year Sea Change programme of events in the Hebrides and Northern Isles of Scotland. In Nelson's own words, the artwork was a response to "... the way arctic terns' migration patterns have been altered as a result of rising sea surface temperatures; the number of sand eels which the terns eat are declining, and this can lead the birds to change their migration routes looking for food, with the result of some colonies becoming 'lost'" (Nelson, 2012a). The impacts that the Bird Yarns project highlighted therefore conformed to the research requirement of specific and localised climate change impacts.

Nelson herself is an artist, and had little prior knowledge of climate change before becoming involved with Cape Farewell and this project (Nelson, 2012a). Nelson designed a knitted arctic tern and worked with members of a local knitting group in Tobermory on the Isle of Mull to create a 'flock' of arctic terns. In total, 72 terns were knitted and displayed on wires along Tobermory's fisherman's pier in June 2012. Next to the birds, was an audio description of the migration of the arctic tern, and the effects of climate change written by nature writer Kenny (Taylor, 2012) and read by local wildlife photographer Gordon Buchanan. The nature of the project thus provided opportunities to engage with both local producers and consumers of the artwork.

### 3.2. The Q study

To maintain a focus on locally produced constructions of climate change through art, a participant-led, exploratory method was sought that as far as possible privileged the subjective constructions of climate change in the words of the participants themselves. The core concern was to uncover specific and localised meanings, expressed through situated discourses within that local community, rather than trying to measure pre-defined (e.g., expert) conceptualisations across a wide population. Such fixed meanings belie the subjective nature of emotional reactions to artworks and would do little to respond to the calls outlined above for attending to local constructions of climate change.

Q Methodology ("Q") was chosen as an appropriate method that would facilitate the desired focus on subjective constructions of climate change amongst producers and consumers of the artwork (see Watts and Stenner, 2012 for an overview of Q). While traditional 'R-

**Table 1**  
Q- set statements and ideal Q sort rankings for each discourse.

Statement	Affective (Aff), Behavioural (Beh) or Cognitive (Cog) engagement	General attitude (Gen) or Exhibition specific (Exh)	Discourse		
			A Climate Conscientious	B Undecided about climate change	C Sceptical about climate change
1 Our effect on climate is insignificant compared to nature	Beh	Gen	-2	-3	0
2 I try to have a low carbon footprint despite the fact that it is often the more expensive option	Beh	Gen	2	-2	0
3 I don't feel that Arctic tern migrations are important to me personally	Aff	Exh	-1	-2	1
4 Recent observed warming is caused directly by human activities	Cog	Gen	1	-1	-4
5 People are more motivated by economic incentives than artworks which encourage voluntary actions	Beh	Exh	1	0	3
6 I am not worried about climate change for myself, but I am worried for my children and grandchildren	Aff	Gen	3	1	0
7 I need more information to form a clear opinion about climate change	Cog	Gen	-1	1	3
8 Artworks, like the Bird Yarns exhibit, have a role in imagining and interpreting climate change	Aff	Exh	1	2	0
9 Artworks, like the Bird Yarns exhibit can offer a wider perspective than science alone	Aff	Exh	1	0	-3
10 I already take steps to tackle climate change	Beh	Gen	0	0	0
11 I feel more concerned about climate change having seen the exhibition	Aff	Exh	-3	0	-2
12 I learnt something new from the piece that I did not already know	Cog	Exh	2	2	-1
13 As an individual, I feel powerless to do anything about climate change	Beh	Gen	-3	0	0
14 It is important to give positive messages of the future, even in the face of environmental change	Cog	Exh	0	0	2
15 The piece makes me more aware of the interdependence between people and the environment	Cog	Exh	-4	2	-1
16 The climate change argument has been going on so long I feel saturated and no longer care	Aff	Gen	-2	-1	1
17 I am more concerned about other forms of environmental degradation (e.g. dredging) than climate change	Cog	Gen	-1	-3	2
18 I don't get the purpose of the piece	Cog	Exh	-1	-3	2
19 I am willing to change my lifestyle regardless of the causes of climate change	Beh	Gen	2	3	1
20 I have personally observed the climate changing	Cog	Gen	1	-4	-2
21 Arctic terns are a miner's canary – an indicator that we all need to do something about climate change	Aff	Exh	1	3	0
22 I think of myself as someone who is environmentally aware	Aff	Gen	3	-2	1
23 Many experts disagree on the causes of climate change	Cog	Gen	-3	1	4
24 I intend to do more to help the climate having seen the exhibition	Beh	Exh	-1	1	-1
25 The piece is a talking point and its importance is in highlighting the issue of climate change	Cog	Exh	0	3	-1
26 I am already concerned about climate change	Aff	Gen	2	-1	1
27 The artwork made me smile	Aff	Exh	3	4	3
28 I understand the impacts of climate change more having seen the exhibition	Cog	Gen	-1	1	2
29 To make big differences, we need strong governmental action	Beh	Gen	3	0	2
30 The piece was interesting and thought provoking	Cog	Exh	0	2	-3
31 The piece is another bit of evidence demonstrating that climate change is a real issue	Cog	Exh	0	-1	-2
32 I feel confused in knowing what to do to tackle climate change	Beh	Gen	-1	0	-1
33 Artists are climbing on the “green bandwagon”	Aff	Exh	-2	-2	0

(continued on next page)



Table 1 (continued)

Statement	Affective (Aff), Behavioural (Beh) or Cognitive (Cog) engagement	General attitude (Gen) or Exhibition specific (Exh)	Discourse		C Sceptical about climate change
			A Climate Conscientious	B Undecided about climate change	
34 I came to see the artwork because I am already interested in climate change	Beh	Exh	0	-1	-3
35 I found the community involvement of the piece more interesting than the climate change message	Cog	Exh	0	1	1
36 I trust Gordon Buchanan more than media or artists	Cog	Exh	0	-1	-1

methodology' techniques such as surveys and opinion polling are essentially researcher-led and attempt objective testing of pre-conceived hypotheses, Q (named Q to distinguish it from 'R') is participant led and seeks explicitly to understand the subjective constructions and viewpoints of participants (Watts and Stenner, 2012). Q studies have been widely used in explorations of pro-environmental attitudes among the public (e.g. Barry and Proops, 1999; Lorenzoni et al., 2007; O'Neill and Nicholson-Cole, 2009) as well as environmental policy analysis (Durning, 1999; Ellis et al., 2007; Ockwell, 2008).

As well as its participant-led nature and focus on participants' own subjective constructions of an issue, Q was further deemed appropriate due to it privileging of the words of participants themselves (as opposed to researcher-designed questions or statements) (Ockwell, 2008) and working well with small numbers of participants. Q achieves statistical significance based on the number of statements involved in a Q study and the number of possible responses each participant can give to each statement. It can thus achieve statistically significant and analytically meaningful results from as few as 15 participants, where each participant is asked to respond to 36 statements along a Likert scale from -4 to +4 (Barry and Proops, 1999). With such a small number of participants, it cannot claim that the findings are representative of a wider population; but it can reveal patterns reflective of discourses that exist in wider society (Ockwell, 2008). The core concern, therefore, is not the number of participants, but the extent to which they represent a cross-section of relevant stakeholders in relation to the issue under examination. These guidelines were therefore used in the design and execution of the current study.

### 3.3. Concurrence and Q set

Step 1 of a Q study is to establish a "concurrence" of statements in relation to a given subject. These statements are assumed to represent the population of viewpoints on a given subject. A powerful aspect of Q is that the initial concurrence of statements and resulting sub-set ("Q set") that participants are asked to respond to, are statements made by stakeholders themselves (as opposed to being questions framed by the researcher). In total, over 120 statements were gathered: the majority from semi-structured interviews with visitors to the exhibition as well as some from a talk by the artist, Deirdre Nelson, and Ruth Little, director of Cape Farewell. The remainder were gathered from literature on Cape Farewell (from Buckland et al., 2006; CapeFarewell, 2012a; CapeFarewell, 2012b; Yusoff and Gabrys, 2011).

Step 2 is to select a smaller, more manageable sub-set of statements (the Q set) to present to participants. Thirty-six statements were chosen to make up the Q set. Selection is achieved by first breaking down the subject matter into a series of component themes or issues on the basis of a preconceived theory or through research and observation (Watts and Stenner, 2012). In the case of the current study, the conceptual insights in Sections 1 and 2, above, were used as guiding criteria. Statements were sought that expressed feelings towards climate change and the extent to which the artwork had influenced them, including statements relating to emotional engagement and risk perception, trust, place attachment and prior pro-environmental values and behaviour.

Each individual statement makes their own contribution to the Q set, and each item should sit neatly side by side without creating unsightly gaps or redundant overlaps - thinking of each item as a carpet tile proved to be a useful analogy for this process (Watts, 2008). To do this, the researcher begins by breaking down the relevant subject matter into a series of component themes or issues on the basis of a preconceived theory or through research and observation (Watts and Stenner, 2012). The choice of the final statements was executed in direct reference to the following questions: 1) did participants feel their attitudes changed as a result of the exhibition? And, 2) what factors contribute to, or contextualise this change? The topics covered in the Q set were also chosen to include emotional engagement and risk perception as well as prior pro-environmental values and behaviour.

The concourse was first divided in two, one half dealing with self-reported prior values and the other with attitudes directly related to the artwork. Both of these collections were then broken down into a further three sections, relating to the three facets of engagement – cognitive, affective and behavioural (Lorenzoni et al., 2007). For example ‘I feel more concerned about climate change having seen the exhibition’ is a statement from the ‘half’ set dealing with attitudes directly relating to the exhibition, and concerns affective engagement; and ‘recent observed warming is caused directly by human activities’ is an example of a statement from the ‘prior attitudes’ half-set, dealing with cognitive engagement. Note that the changes in attitude these statements refer to were all self-reported as we lacked sufficient resources to do a pre- and post- Q sort with each participant, or to measure the longer term changes in individual engagement which could be instigated by visiting art projects (see areas for future research in the discussion below). The final Q set (see Table 1, below) therefore represented a cross-section of statements relating to all of the above concerns. Alongside the Q study, participants were asked to complete a short survey which included demographic data, and the question “do you feel you have changed your opinion of climate change as a result of seeing the exhibition?”, the latter providing an indication of self-reported attitude change.

### 3.4. Participants

Fifteen people were recruited for the Q study – the minimum number (noted above) that Barry and Proops (1999) identify as necessary to facilitate meaningful results from a Q set of 36 statements. There were 9 women and 6 men recruited, aged between 20 and 65. The participants were recruited next to the artwork by approaching them on the pier; all also completed a survey of attitudes towards climate change providing them with the opportunity to express how they perceived their attitudes to have been influenced by their experience of the artwork. These represented a cross-section of the observed types of people visiting the exhibition. There were: four tourists visiting the island and the exhibition, (many of whom, it should be noted, visit the Hebrides for the landscape and the wildlife); three residents<sup>1</sup> of Mull involved in the art community who were also involved in knitting the terns for the exhibition (one permanent resident and two temporary residents); three residents involved in environmental work; and five other residents of Mull who were permanent residents but had no involvement with either the art community or environmental work.

The exhibition was up for two weeks in June and July 2012, so all the participants were recruited in this time during two weeks of fieldwork. The piece was located on a pier, so the lead author sat on the end of the pier and spoke to people before and after they walked along the pier to see the work. The research was somewhat weather permitting, and there were 2 ½ days when it rained and as there were so few visitors, we decided against pursuing the research at these times.

### 3.5. Procedure

The participants were asked to sort the 36 statements into how much they agree or disagree with that particular statement, on a nine-point Likert scale from -4 ‘strongly disagree’ through 0 ‘neither agree or disagree’ to 4 ‘strongly agree’. Participants were given an A3 chart to arrange the statement cards on, comprising outlines of boxes the same size as the cards arranged in the shape of a normal distribution. This typical ‘pyramidal’ structure of a Q-sort is used to encourage participants to give careful consideration to their ranking of each statement relative to their ranking of others – a process similar to that involved in preferential voting (McKeown and Thomas, 1988). The Q-sorts were conducted in the researcher’s presence, allowing for recorded

interviews of between 10 and 15 min in which they could explain their decisions in ranking each statement. The collection of this additional information during a participant’s Q sort is then later used in the interpretation of the different Q sorts. This provides a further way in which Q methodology seeks to minimise researcher influence in the process, using the interviews to allow the participants in their own words to clarify why they ranked each statement as they did.

### 3.6. Statistical analysis

To analyse the Q sorts, the free PCQ online software PQMETHOD was used (Schmlock, 2002). The package correlates each Q sort with every other Q sort. The inter-correlation matrix is then analysed by the centroid procedure, and the factors rotated using a combination of Varimax rotation and judgemental “by hand” rotation to maximise the % variation the factors are able to collectively explain. A total of three factors with eigenvalues greater than one were extracted. Q is then able to produce “ideal Q sorts” for each factor, enabling the researcher, based on the interviews with the participants during and after their Q sorts, to interpret these ideal sorts into representative discourses loaded on by the different participants.

## 4. Results

Three factors were extracted from the statistical analysis, a typical amount for the number of statements and participants (Watts and Stenner, 2012). The ideal Q sorts for each of these factors are detailed in Table 1.

There is only one statement with consensus across all discourses, which is statement 10 “I already take steps to tackle climate change” (A0, B0, C0). A number of statements had consensus over two discourses and a similar score to the third, such as 27 “the artwork made me smile” (A + 3, B + 4, C + 3) and 32 “I feel confused in knowing what to do to tackle climate change” (A-1, B0, C-1)

The statements used to describe each discourse below are either those with the strongest agreement or disagreement, or the statements that statistically distinguish the discourse from other factors. Demographic patterns are included to add depth to the descriptions, although, as noted, due to the nature of the study and small participant number this cannot be considered to be generalizable or representative.

### 4.1. Discourse A: climate-conscientious: unmoved by the artwork

This discourse is characterised by describing itself as environmentally aware (statement 22) and informed about climate change (7). It expresses a belief that experts are agreed about the causes of climate change (23) and a sense of empowerment to tackle climate change (13). It reflects a perception of efforts to have a low carbon footprint being worthwhile despite it often being the more expensive option (2). Statement 15 is strongly disagreed with: ‘the piece makes me more aware of interdependence of people and the environment’, and all other statements concerning the artwork are ranked indifferently (between -1 and 1). A consciously ‘green’ perspective is implied, and one that feels generally unaffected or negatively towards the artwork. For example, one participant whose Q sort was characteristic of this discourse described in the interview how he was ‘wholly underwhelmed’ by the piece.

Individuals who loaded heavily on this discourse were predominantly visitors to the island, or temporary residents working in the environmental sector. Men and women were fairly equally represented and all participants, bar one, self-reported as not having changed their attitudes at all as a result of the exhibition. Ages ranged from 25 to 60+, with the majority of the study’s participants aged 40 or over falling into this category.

<sup>1</sup> Unless otherwise specified, ‘residents’ refers to either permanent or temporary residents of Mull.

#### 4.2. Discourse B: undecided about climate change: enjoyed and engaged with the artwork

This discourse is characterised by feelings of not being environmentally aware (22), not having observed the climate changing (20) and not having been previously concerned with climate change (26). The statements most strongly agreed with are 25, 30, 28: the importance of the piece as a talking point, that piece being interesting and thought provoking and something new having been learnt from the piece. One participant that loaded heavily on this discourse describes how she “learnt how critical one aspect of the bird’s life can be [the rising sea surface temperatures which influence where sand eels are found at different times], they’re going to be in serious trouble and it makes me think that the eco-ladder is getting very wobbly. It makes me think of the interdependence of wildlife and how ultimately in shortening other species’ lives, we are also reducing our own.” Another describes how “everybody is talking about the birds, I was chatting to the girl in the bank and telling her they were actually about climate change.”

The discourse implies a perspective that is open to discussions about the impacts of climate change on the local environment; given that it identifies as not being particularly knowledgeable about environmental issues, it reflects a desire to know more. It appears to be more motivated by deliberative, discursive engagement than ‘fact provision’.

Individuals loading on this discourse were all female, and permanent residents on the island with no prior affiliation to the environmental or art communities; ages of individuals ranged from 25 to 50. All of them also self-reported as having changed their attitudes as a result of the exhibition in the surveys.

#### 4.3. Discourse C: sceptical about climate change: unmoved by the artwork

The most important statements for this discourse are that experts disagree on the causes of climate change (23), that recent warming is not caused directly by humans (4) and that more information is needed to form a clear opinion on climate change (7). The discourse is characterised by a dislike of the artwork; it does not understand the purpose of the piece (18), does not feel that anything new was learnt (28), and stresses that the piece was neither interesting nor thought provoking (30). Unlike the other discourses, discourse C takes a contrarian view of climate change and is resistant to accepting information that challenges this.

The individuals loading on this discourses were either permanent or temporary residents of the island, who worked either in the fishing industry or in conservation. There are two interesting aspects of this particular discourse. Firstly, several of them were residents working in conservation and yet they associate with a discourse that is sceptical about climate change. Secondly, they were made up of some of the youngest participants, none being over 26. Men and women were equally represented and none self-reported as having changed their attitudes as a result of seeing the exhibition.

### 5. Discussion

#### 5.1. Biased assimilation

The results demonstrate strong resonance with the literature on prior values and biased assimilation. Both discourses A (climate conscientious) and C (climate sceptical) describe themselves as inherently holding strong attitudes towards the environment, and both dismiss the information contained in, or the impact of the artwork. Although discourse A suggests that something new was learnt from the art, it also suggests a sense of being impervious to the piece’s ability to make it more aware of the interdependence of people and environment. All other statements related to the piece are ranked indifferently suggesting a dismissal of the emotional (rather than informative) elements of the

work. Discourse C is sceptical about climate change, and this scepticism is reflected in dismissal of new information about climate change. The piece is described as uninteresting and nothing new was learnt from the piece.

In this context it is clear that those who already have strong feelings towards the idea of climate change were unwavering in their opinions and disregarded the ‘climate artwork’; in the case of pro-environmental discourse A, the piece was deemed underwhelming, and climate sceptical discourse C finds it uninteresting. However, consistent with the literature on attitude ambivalence (Maio et al., 1996), in the case of discourse B, it appears that where there was minimal prior attitude (either pro-environmentally or climate sceptically), there was more openness to the artwork. All participants who loaded heavily on this discourse also self-reported as changing their attitudes towards climate change as a result of the art. This seems to reinforce the idea that where environmental values and attitudes are weak, individuals are more open to assimilating new information. This demands a more nuanced and exploratory approach to understanding what influences participants loading on discourse B’s engagement with the artwork. It also suggests that, as with other climate change communication media, participatory artwork is unlikely to be able to achieve affective engagement with climate change amongst those people with strong existing attitudes on the subject. As noted elsewhere (Bostrom et al., 2013), the highly heterogeneous nature of climate change perceptions demands a tailored approach to climate change communication. Specifically, the greatest attitude change is likely to be amongst the ‘ambivalent middle’ – those who are neither highly concerned nor highly sceptical.

#### 5.2. Positive imagery

Many authors have argued against the use of overtly negative or apocalyptic imagery as this can lead to distancing, apathy and resignation (Bechara and Damasio, 2005; Kollmuss and Agyeman, 2002; Moser, 2007; O’Neill and Nicholson-Cole, 2009). Bird Yarns (Nelson, 2012b) was explicitly designed to be a positive engagement with environmental change (Nelson, 2012a); reflected in the finding that all discourses agreed or strongly agreed with statement 27 “the artwork made me smile”. A participant loading on discourse A describes the artwork by saying that “I thought [the birds] were real at first, and then they didn’t move, so I came over because I was intrigued. It made me laugh when I realised it was ‘a trick’”. This sentiment of approaching the artwork out of curiosity and laughing at the work was common across all discourses. Other comments included the birds in the artwork being described as “great fun”, and the piece as “really engaging”. For one participant it “endeared me to the terns a bit more, as they usually dive-bomb me, so I don’t really like them!” The artist herself asserted humour as being a deliberate consideration in engaging people with the work. This is significant as humour is generally accepted as representing a positive emotional response within the psychological literature (albeit a response arrived at via initial and complex cognitive processing in order to derive the humour, e.g. Shibata et al. (2014)). Participants describe how the piece is “a lovely representation”, it makes you curious”, and that “all the birds have different faces and noses”, “they all have different characters” and “different personalities”, suggesting an emotional engagement with the piece. Whilst humour did not lead to a change in attitudes amongst those participants with strong prior environmental values, it seemed to figure strongly in the reactions (captured during post-Q sort discussions) of those loading on discourse B who lacked strong prior values.

As Lorenzoni et al. (2007) point out, however, the connection between any emotional engagement with climate change and action in terms of low-carbon behaviour change is not a linear progression, but a complex relationship. While we cannot claim that a positive experience with climate change artwork will necessarily lead to lower carbon behaviours, this emotional engagement and the development of a stronger



sense of pro-environmental values could influence the means by which future information about the climate or the environment is assimilated. The impact of the artwork on these originally more climate neutral participants is therefore potentially significant. As noted in the methodology, however, we did not have the resources to conduct pre- and post- Q sorts, or to measure the longer term changes in individual engagement which could be instigated by visiting art projects, both of which constitute important areas that future research in this field should focus on.

### 5.3. *Trusted sources, place attachment and situated knowledge*

The one statement (36) referring to trust of sources was ranked indifferently across all discourses (A0, B-1, C-1). However, discourse B, which is the only one to emphasise learning something new and finding the piece thought provoking, also emphasises the importance of the piece as representing a talking point and something to be discussed with peers. Participants loading heavily on discourse B describe how the piece promoted discussion among neighbours in informal settings, such as the local bank. That participant also went on to describe how she would “trust Gordon [Buchanan] and trust my friends over the news”. This suggests that for those participants without strong prior environmental values, there exists a relationship between the locally discursive elements of the piece and the process of learning about and engaging with climate change. This connection between dialogue and informal conversations and the description of the artwork as a stimulus for learning speaks strongly to the arguments of scholars who emphasise the need for more discursive and conversational forms of peer engagement with climate change (Butler et al., 2011; Moser, 2007; Ungar, 2007).

The Bird Yarns artwork described climate change impacts that were already occurring in the local area by highlighting the changing patterns of migrant terns due to rising sea temperatures. Although statement 3 ‘I don’t feel that Arctic tern migrations are important to me personally’ did not elicit a strong response from discourse B (-1), the discourse did reflect agreement with statements 21 ‘arctic terns are a miner’s canary – an indicator that we all need to do something about climate change’ and 15 ‘the piece makes me more aware of the interdependence between people and the environment’ as well as 28 ‘I understand the impacts of climate change more having seen the exhibition’. A participant loading on discourse B describes how “the piece gave a specific example that is happening here, that I didn’t know about. When you’re given something specific, it’s not a generality anymore. Somehow, because it was about small changes [in the local environment], it made me think that actually small things I do *can* make a difference”. The connection between the local environment, the local community with whom to discuss this and the fact that participants loading on this discourse felt that their opinion of climate change had changed as a consequence of seeing the piece suggests that the success of the artwork was in part also due to the localised nature of the knowledge and attachment to the local area. This extends both to its physical and biodiversity attributes as well as the social fabric through which these elements are understood.

The nature of this kind of artwork in an informal, local setting may also hold relevance in terms of the nature of people’s experience and engagement with the piece. Bird Yarns was not situated in a gallery. It was outside and attracted visitors who would not normally visit an “art” or a “climate change” exhibition. Three participants in the study expressed surprise that the work was considered to be art at all. One of these asserted that they would “never step foot inside a gallery”. None of the research participants came to see the exhibition deliberately, it was something visitors would happen upon as they walked along the pier. This integration of the artwork within the local environment and its integration into people’s everyday lived experiences appears to play an important role in engaging those who might not otherwise be motivated to learn about climate change.

## 6. Conclusions and implications for policy and future research

Based on the literature reviewed and the study conducted in this paper it would seem that creative arts represent an important and under-researched area of enquiry within the social sciences. The literatures on climate change communication and public engagement with climate change (including climate compatible behaviour change) highlight several areas that could be usefully explored through a focus on creative arts, with particular potential for extending enquiry into ways of achieving affective (emotional) engagement with climate change. Participatory arts also seem ideally suited to responding to broader social science concerns with the role of lay knowledge in decision making - concerns which have led to explicit calls for a more situated knowledge in relation to climate change communication.

The results of the study point to a number of relevant insights and several areas for further investigation. The findings support assertions from prior research on biased assimilation and suggest that many participants engaging with participatory climate change arts projects may not be influenced due to the existence of strong prior environmental values. Importantly, however, the findings reinforce the significance of people who have not yet made up their minds about climate change and are open to learning more (cf. Maio et al., 1996). Dunwoody (2007) argues that it is important to put resources into campaigns that have a fighting chance of working, even if this includes the painful process of ‘writing off’ certain sections of the public whose attitudes may collide with one’s message. Notwithstanding the complex relationship between cognitive and affective engagement and behavioural change, the existence of these undecided people whose engagement with climate change was impacted on by their experience of the artwork implies that both research and policy can usefully seek to engage with such people.

The findings also provide several salient pointers regarding how and why these undecided people engaged more with climate change through the artwork. Positive imagery and humour figured strongly in their expressions of what drew them to the artwork and helped them to engage with it. Importantly, the situation of the artwork within the local, everyday lived environment was a prominent factor in participants’ self-expressed experiences of how they engaged with artwork and why it impacted on them. This included specific recognition of the local situatedness of the art leading to informal conversation, dialogue and place specific discussion around the idea of climate change. This was reinforced by the artwork’s engagement with a locally perceptible impact of climate change.

As well as expanding upon the current research in different contexts, a number of other specific areas for future enquiry can be identified. Important questions could be asked around the different dimensions that affect people’s engagement with climate change through creative practices. For example, are participatory practices of art production more effective than the passive viewing of an artwork? What are the longer term effects of any changes in engagement with climate change? These questions have methodological implications; with different methods and epistemological approaches of addressing different aspects of creative or participatory art practices. Emphasising multi-directional communication, an exciting avenue for research is to innovate around using art-production as a means to understand what climate change means to people on an everyday level – as a means not merely for policy and power to speak to ‘the public’, but in order to give local diverse communities a voice with which to explore ideas of what climate means to them – and speak back to policy. Given the way in which humour figured as a significant factor in this study, it would also be of value to direct specific attention to researching the role of humour in relation to climate change engagement, as distinct from the literature’s existing focus on positive versus negative/apocalyptic imagery. It would also be useful to investigate the ways in which the environment in which art work is experienced might impact on visitors’ engagement in the short and long term with the theme of the work. For example, research could exhibit the same art project concurrently in two different

settings, e.g. indoor/outdoor; urban/rural, etc., to evaluate the effect on visitor attendance, characteristics, engagement with the theme, any attitude change and potential behaviour change. Another area warranting specific attention is research with a longitudinal focus, able to track the impacts of engagement with artwork and subsequent behavioural changes. This could include use of social psychology metrics as well as follow up interviews with participants in, and observers of, climate related artworks<sup>2</sup>.

Whilst the study presented here reinforces the relevance of some established concepts from existing literature on climate communication and public engagement with climate change (e.g. biased assimilation and positive imagery), it nevertheless asserts the potential importance of new research focussed directly on the role of the arts in engaging people with climate change. But the instinctive expectation that the plethora of positive arts-based climate change initiatives that already exist will have a positive impact is not enough. The urgency of climate change as a social issue, and the challenges this raises in seeking democratically legitimate ways forward, demands specific attention to how and why artistic interventions play a role in engaging people (and which people in particular) with climate change, as well as the role they might play in giving people a voice in relation to climate change policy. This can only be achieved by careful, interdisciplinary collaboration across the social sciences and arts in the design, execution and analysis of arts-based interventions, with significant subsequent implications for better informing policy and practice.

## References

- Barry, J., Proops, J., 1999. Seeking sustainability discourses with Q methodology. *Ecol. Econ.* 28, 337–345.
- Bechara, A., Damasio, A., 2005. The somatic marker hypothesis: a neural theory of economic decision. *Games Econ. Behav.* 52, 336–372.
- Bostrom, A., Böhm, G., O'Connor, R.E., 2013. Targeting and tailoring climate change communications. *WIREs Clim. Change* 4, 447–455.
- Bottoms, S., 2012. Climate change 'science' on the London stage. *Wiley Interdiscip. Rev. Clim. Change* 3, 339–348.
- Brace, C., Geoghegan, H., 2010. Human geographies of climate change: landscape, temporality and lay knowledges. *Prog. Hum. Geogr.* 35, 284–302.
- Bryan, J., 2011. Walking the line: participatory mapping, indigenous rights and neoliberalism. *Geoforum* 42, 40–50.
- Buckland, D., McEwan, I., Gormley, A., Whiteread, R., Eastley, M., Edwards, N., Ehrlich, G., Harvey, D., 2006. *Burning Ice: Art and Climate Change*. Cape Farewell, London.
- Butler, R., Margolies, E., Smith, J., Tyszczuk, R., 2011. *Culture and Climate Change: Recordings. Shed and The Open University*, Cambridge.
- Cant, S.G., Morris, N.J., 2006. Geographies of art and the environment. *Soc. Cult. Geogr.* 7, 875–861.
- CapeFarewell, (2012a).
- CapeFarewell, 2012b. Cape Farewell Strategic Plan 2008 – 2011. Cape Farewell, London.
- Capstick, S., Whitmarsh, L., Poortinga, W., Pidgeon, N., Upham, P., 2015. International trends in public perceptions of climate change over the past quarter century. *Wiley Interdiscip. Rev. Clim. Change* (6), 35–61.
- Chawla, L., 1998. Significant life experiences revisited: a review of research on sources of pro-environmental sensitivity. *J. Environ. Educ.* 29, 11–21.
- Chawla, L., 1999. Life paths into effective environmental action. *J. Environ. Educ.* 31, 15–26.
- Corner, A., Whitmarsh, L., Xenias, D., 2012. Uncertainty, scepticism and attitudes towards climate change: biased assimilation and attitude polarisation. *Clim. Change* 114 (3–4), 463–478.
- Damasio, A., 1994. *Descartes' Error: Emotion, Reason and the Human Brain*. G.P. Putnam's Sons, New York.
- Daniels, S., Endfield, G.H., 2009. Narratives of climate change: introduction. *J. Hist. Geogr.* 35, 215–222.
- Dixon, D., Hawkins, H., Straughan, E., 2012. Of human birds and living rocks: remaking aesthetics for post-human worlds. *Dialogues Hum. Geogr.* 2, 249–270.
- Doyle, J., 2007. Picturing the climate(c)tic: greenpeace and the representational politics of climate change communication. *Sci. Cult.* 16, 129–150.
- Dunwoody, S., 2007. The challenge of trying to make a difference using media messages. In: Dilling, S.M.L. (Ed.), *Creating a Climate for Change: Communicating Climate Change and Facilitating Social Action*. Cambridge University Press, New York.
- Durning, D., 1999. The transition from traditional to postpositivist policy analysis: a role for Q methodology. *J. Policy Anal. Manage.* 18, 389–410.
- Ellis, G., Barry, J., Robinson, C., 2007. Many ways to say 'no', different ways to say 'yes': applying Q methodology to understand public acceptance of wind farm proposals. *J. Environ. Plann. Manage.* 50, 517–551.
- Endfield, G.H., Morris, C., 2012. Cultural spaces of climate. *Clim. Change* 113, 1–4.
- Engelmann, S., 2015. Towards a poetics of air: sequencing and surfacing breath. *Trans. Inst. Br. Geogr.* 40, 430–444.
- Epstein, S., 1994. Integration of the cognitive and psychodynamic unconscious. *Am. Psychol.* 49, 709–724.
- Ereaut, G., Segnit, N., 2006a. *Warm Words, How We Are Telling The Climate Story And Can We Tell It Better?* Institute for Public Policy Research, London.
- Ereaut, G., Segnit, N., 2006b. *Warm Words: How We Are Telling The Climate Story and Can We Tell It Better?* Institute for Public Policy Research, London.
- Fischer, F., 2000. *Citizens, Experts and the Environment*. Duke University Press, Durham and London.
- Foster, K., Lorimer, H., 2007. Some reflections on art-geography as collaboration. *Cult. Geogr.* 14, 425–432.
- Hawkins, H., 2010. Turn your trash into... rubbish art and politics. richard wentworth's geographical imagination. *Soc. Cult. Geogr.* 11, 805–827.
- Hawkins, H., 2015a. Creative geographic methods: knowing, representing, intervening. On composing place and page. *Cult. Geogr.* 22, 247–268.
- Hawkins, H., Marston, S., Ingram, M., Straughan, E., 2015b. The art of socioecological transformation. *Ann. Inst. Am. Geogr.* 105, 331–341.
- Hawkins, H., Straughan, E., 2014. Nano-art, dynamic matter and the sight/ sound of touch. *Geoforum* 51, 130–139.
- Howell, R.A., 2011. Lights, camera ... action? Altered attitudes and behaviour in response to the climate change film the age of stupid. *Glob. Environ. Change* 21, 177–187.
- Hulme, M., 2009. *Why We Disagree About Climate Change: Understanding Controversy, Inaction and Opportunity*. Cambridge University Press, Cambridge.
- Hulme, M., 2011. Meet the humanities. *Nat. Clim. Change* 1, 177–179.
- Ingram, M., 2013. Washing urban water: diplomacy in environmental art in the Bronx, New York City. *Gend. Place Cult.* 21, 105–122.
- Jasanoff, S., 2004. The idiom of co-production. In: Jasanoff, S. (Ed.), *States of Knowledge. The Co-Production of Science and Social Order*. Routledge, Abingdon, UK.
- Jellis, T., 2015. Spatial experiments: art, geography, pedagogy. *Cult. Geogr.* 22, 369–374.
- Kollmuss, A., Agyeman, J., 2002. Mind the gap: why do people act environmentally and what are the barriers to pro-environmental behaviour? *Environ. Educ. Res.* 8, 239–260.
- Leach, M., Scoones, I., Stirling, A., 2010. *Dynamic sustainabilities: technology, environment. Social Justice*. Routledge, Abingdon.
- Leiserowitz, A., 2006. Climate change risk perception and policy preferences: the role of affect, imagery and values. *Clim. Change* 77, 45–72.
- Loewenstein, G., Weber, E., Hsee, C.K., Welch, N., 2001. Risk as feelings. *Psychol. Bull.* 127, 267.
- Lorenzoni, I., Nicholson-Cole, S., Whitmarsh, L., 2007. Barriers perceived to engaging the public with climate change among the UK public and their policy implications. *Glob. Environ. Change* 17, 445–459.
- Lorenzoni, I., Whitmarsh, L., 2014. Climate change and perceptions, behaviours and communication research after the IPCC 5th assessment report. *WIREs Clim. Change* 5, 703–708.
- Lowe, T., Brown, K., Dessai, S., de Franca Doria, M., Haynes, K., Vincent, K., 2006. Does tomorrow ever come? Disaster narrative and public perceptions of climate change. *Public Underst. Sci.* 15, 435–457.
- Maio, G., Haddock, G., 2010. *The Psychology of Attitudes and Attitude Change*. Sage, London.
- Maio, G.R., Bell, D.W., Esses, V.M., 1996. Ambivalence and persuasion: the processing of messages about immigrant groups. *J. Exp. Soc. Psychol.* 32, 513–536.
- Manzo, C.L., Devine-Wright, P., 2013. *Place Attachment: Advances in Theory, Methods and Applications*. Routledge, Abingdon.
- McKeown, B., Thomas, D., 1988. *Q Methodology*. Sage, Newbury Park.
- Miles, M., 2010. Representing nature: art and climate change. *Cult. Geogr.* 17, 19–35.
- Moser, S., 2007. More bad news: the risk of neglecting emotional responses to climate change information. In: Moser, S., Dilling, L. (Eds.), *Creating a Climate for Change: Communicating Climate Change and Facilitating Social Change*. Cambridge University Press, New York.
- Moser, S.C., Dilling, L., 2011. *Communicating climate change: closing the science - action gap*. The Oxford Handbook of Climate Change and Society. Oxford University Press, Oxford.
- Nelson, D., 2012a. Artist Talk for Bird Yarn's Exhibition. An Tobar, Tobermory, Isle of Mull.
- Nelson, D., 2012b. Bird Yarns. Cape Farewell, Tobermory, Isle of Mull.
- Nerlich, B., Koteyko, N., Brown, B., 2010. Theory and language of climate change communication. *Wiley Interdiscip. Rev.* 1, 97–110.
- Nicholson-Cole, S., 2005. Representing climate change futures: a critique on the use of images for visual communication. *Comput. Environ. Urban Syst.* 29, 255–273.
- O'Neill, S., Boykoff, M., Niermeyer, S., Day, S.A., 2013. On the use of imagery for climate change engagement. *Glob. Environ. Change* 23, 413–421.
- O'Neill, S., Nicholson-Cole, S., 2009. "fear won't do it": promoting positive engagement with climate change through visual and iconic representations. *Sci. Commun.* 30, 355–379.
- O'Neill, S., Smith, N., 2014. Climate change and visual imagery. *WIREs Clim. Change* 5, 73–87.
- Ockwell, D., 2008. 'opening up' policy to reflexive appraisal: a role for Q methodology? A case study of fire management in Cape York, Australia. *Policy Sci.* 41, 263–292.
- Ockwell, D., Whitmarsh, L., O'Neill, S., 2009. Reorienting climate change communication for effective mitigation forcing people to be green or fostering grass-roots engagement? *Sci. Commun.* 30, 305–327.
- Pallett, H., Chilvers, J., 2013. A decade of learning about publics, participation, and climate change: institutionalising reflexivity? *Environ. Plann. A* 45, 1162–1183.

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- Petty, R.E., Cacioppo, J.T., 1986. The Elaboration Likelihood Model of Persuasion. Academic Press, New York.
- Pielke, R., 2005. Misdefining “climate change”: consequences for science and action. *Environ. Sci. Policy* 8, 548–561.
- Pollack, H.N., 2005. *Uncertain science... Uncertain World*. Cambridge University Press, Cambridge.
- Poortinga, W., Spence, A., Whitmarsh, L., Capstick, S., Pidgeon, N., 2011. Uncertain climate: an investigation into public scepticism about anthropogenic climate change. *Global Environmental Change* 31, 1015–1102.
- Rees, M., 2017. Museums as catalysts for change. *Nat. Clim. Change* 7, 166–167.
- Schmlock, P., 2002. PCQ Analysis Software.
- Sheppard, S., 2005. Landscape visualisation and climate change: the potential for influencing perceptions and behaviour. *Environmental Science Policy* 8 673–645.
- Sheppard, S., 2012. *Visualising Climate Change: A Guide to Visual Communication of Climate Change and Developing Local Solutions*. Earthscan, Abingdon.
- Shibata, M., Terasawa, Y., Umeda, S., 2014. Integration of cognitive and affective networks in humor comprehension. *Neuropsychologia* 65, 137–145.
- Shome, D., Marx, S., 2009. *The Psychology of Climate Change Communication: a Guide for Scientists, Journalists, Educators, Political Aides and the Interested Public*. Centre for Research on Environmental Decisions, Columbia, USA.
- Shove, E., 2010. Beyond the ABC: climate change policy and theories of social change. *Environ. Plann. A* 42, 1273–1285.
- Stirling, A., 2008. “opening up” and “closing down”: power, participation, and pluralism in the social appraisal of technology. *Sci. Technol. Hum. Values* 33, 262–294.
- Tall, A., 2010. Climate forecasting to serve communities in West Africa. *Procedia Environ. Sci.* 1, 421–431.
- Taylor, K., 2012. *Arctic Terns*. <http://www.capefarewell.com/seachange/arctic-terns/>.
- Tolia - Kelly, D.P., 2008. Motion/ emotion: picturing translocal landscapes in the nurturing ecologies research project. *Mobilities* 3, 117–140.
- Trexler, A., Johns-Putra, A., 2011. Climate change in literature and literacy criticism. *WiRes Clim. Change* 2, 185–200.
- Ungar, S., 2007. Public scares: changing the issue culture. In: Moser, S., Dilling, L. (Eds.), *Creating a Climate for Change: Communicating Climate Change and Facilitating Social Change*. Cambridge University Press, New York.
- Watts, S., 2008. Social constructivism redefined: human selectionism and the objective reality of Q methodology. *Operant Subj.* 32, 29–45.
- Watts, S., Stenner, P., 2012. *Doing Q Methodological Research: Theory, Method and Interpretation*. Sage, London.
- Weber, E., 2006. Experience-based and description-based perceptions of long term risk: why global warming does not scare us (yet). *Clim. Change* 77, 103–120.
- Weber, E.U., 2016. What shapes perceptions of climate change? new research since 2010. *Wiley Interdiscip. Rev. Clim. Change* 7, 125–134.
- Whitmarsh, L., 2011. Scepticism and uncertainty about climate change: dimensions, determinants and change over time. *Global Environmental Change* 21, 690–700.
- Whitmarsh, L., O'Neill, S., 2010. Green identity, green living? the role of pro-environmental self identity in determining consistency across diverse pro-environmental behaviours. *J. Environ. Psychol.* 30, 305–314.
- Whitmarsh, L., O'Neill, S., Lorenzoni, I., 2011a. Climate change or social change? Debate within, amongst, and beyond disciplines. *Environ. Plann. A* 43, 258–261.
- Whitmarsh, L., O'Neill, S., Lorenzoni, I., 2011b. Engaging the Public With Climate Change: Behaviour Change and Communication. Earthscan, Abingdon.
- Williams, N., 2016. Creative processes: from interventions in art to intervallic experiments through Bergson. *Environ. Plann. A* 48, 1549–1564.
- Wynne, B., 1996. May the sheep safely graze? A reflexive view of the expert-lay divide. In: Lash, S., Szerszynski, B., Wynne, B. (Eds.), *Risk, Environment and Modernity: Towards a New Ecology*. Sage, London, pp. 44–83.
- Yusoff, K., 2007. Antarctic exposure: archives of the feeling body. *Cult. Geogr.* 14, 211–233.
- Yusoff, K., 2010. Biopolitical economies and political aesthetics of climate change. *Theory Cult. Soc.* 27, 73–99.
- Yusoff, K., Gabrys, J., 2011. *Climate change and the imagination*. Wiley Interdiscip. Rev. Clim. Change 2.